

## Research Assistant: Synthesis of Bioactive Molecules

Spring 2020

Credits: 6

**Prerequisites: One year of biology and chemistry at the university level. Laboratory experience at university level is recommended.**

Oscar Verho's laboratory focuses on the development of novel strategies for synthesizing and screening diverse collections of small molecules for therapeutic purposes. The research of the Verho group is deeply rooted in organic chemistry, but also interfaces with the fields of medicinal chemistry and chemical biology. As a research assistant in the Verho group, you would be offered with an opportunity to take part in different synthetic chemistry projects and be able carry out experimental work in an organic chemistry laboratory setting. This includes:

- 1) Synthesis of bioactive peptides: In this project, modern C-H functionalization chemistry will be used to assemble unnatural amino acid derivatives that will serve as building blocks for de novo synthesized peptides. Research assistants would be involved in the design of peptide structures that could become future drugs for currently intractable diseases. Moreover, research assistants would be offered an opportunity to deepen themselves in topics such as transition metal catalysis, peptide chemistry and DNA-encoded libraries.
- 2) Synthesis of a structurally diverse cyclobutane library. The goal of this project is to assemble a classical small molecule screening library consisting of different cyclobutane derivatives. As a part of this project, research assistants will be able to learn and perform a wide range of organic reactions, including for example different directed C-H functionalization reactions. Aside from providing the research assistants with a deep understanding of key concepts in organic chemistry, they would also greatly contribute to the creation of a new small molecule library that could provide promising starting points for drug discovery.

A 6-Credit Research Assistant course is an experiential learning opportunity that allows students to develop research skills in a professional research setting. The course requires an average of 20 hours a week of laboratory, clinical, and/or literature-based research in external research groups at local hospitals, universities, or other research institutions. As a research assistant, you perform research under the supervision of a mentor (a lead scientist in the external research group). The mentor is able to offer both academic and professional advice. In addition to acquiring research experience, the goal is to develop a student/mentor relationship that benefits both the DIS student and Stockholm-based research institutions.

### Student Profile

This course is designed for highly motivated students with a strong interest in developing their research skills. Students must be willing to commit a significant portion of their semester to an engaging opportunity involving hands-on research in universities and institutes in the Stockholm region.

### Learning Objectives

Through this course, DIS students will learn techniques and skills in their field of interest and as applicable to the research focus. Students will be part of an active research team and experience the dynamics of a European research institution. Throughout the semester, students will keep a research journal recording their daily involvement in the research project. At the end of the semester, all students involved in this course will participate in a Research Symposium to present their semester work to peers and invited professionals.

### Structure of Project Work

The student's research project will be a part of a larger, ongoing research project at the research institution. The student must be able to enhance the research being performed and investigate phenomena of interest to them, their mentor, and the research team. The project should be self-directed and self-motivated under the mentor's guidance and supervision. A gradual transition toward independence is encouraged as a student gains confidence and is able to self-direct her or his work.

It is not expected that the student pursues a project where s/he is able to obtain definitive publishable results. The project chosen and agreed upon between the student and mentor should be focused and designed to produce results within the DIS semester calendar. While it is not necessary for the results to be significant (in

that the results find a solution to the problem or hypothesis proposed), arguably any results to the proposed question are significant to the next phase of a research project.

### DIS Contact

Tina Mangieri, PhD, DIS Associate Academic Director and Director of Research: [tma@disstockholm.se](mailto:tma@disstockholm.se)

### Course Location

This DIS course will be located, primarily, at an external institution. Students will need to arrange a schedule with their mentor which will allow them to complete an **average of 20 hours work per week** (total hours may vary according to research opportunity and expectation of mentor).

### Assignments

Throughout the semester, students are expected to complete various assignments to verify their involvement and learning; these will be of benefit to both the student and mentor. The students will be expected to compose the following:

A **literature summary review** will give the student the opportunity to seek out existing peer-reviewed articles and, therefore, enhance their scientific knowledge regarding the specific research field. In addition, it is essential that the student has knowledge of previously produced research by the research institution with which they are working.

An **outline of the research project** will provide the student with a foundational structure to help guide the project's completion. By creating an outline, the student will be able to better comprehend the objective of her/his efforts. The mentor will also be able to use the outline to assess areas in which the student's current knowledge and understanding may be lacking.

A **research abstract** explaining the importance and overall objective of the research the student has done. The abstract provides the student an outlet to think about their research concisely, thereby gleaning the most essential points from the project completion.

In conjunction with the submission of the research abstract there will be a **research symposium** where students will present the research they have carried out throughout the semester. Students will create a poster that supports their abstract and outlines the main aspects of their work; the poster is created with the guidance and approval of the research mentor. The poster session is part of a research symposium organized by DIS to showcase end-of-semester work across the curriculum.

The **research paper** is the final product of the 6-credit research assistantship. The paper will explain the student's work throughout the semester and will include the overall process, the project's significance, and the contribution to the field of research in which the student engaged. Please note: this research paper is not produced with the intent of publishing. The final research paper will include the following:

- Abstract
- Introduction
- Background
- Method(s)
- Results
- Discussion
- Conclusions

### Evaluation

Literature Summary Review	(5%)
Outline of Research Project	(5%)
Abstract	(5%)
Research Paper (10-15 pages)	(60%)
Poster Presentation at Research Symposium	(20%)
Participation	(5%)

Research Assistants are required to participate in two (2) **workshops** during the semester. The content of the workshops is subject to change and may include overviews/introductions of skills your mentor will expect you to execute, as well as discussions on the goals of research and the ways in which research questions are culturally and historically-contingent. Workshop examples include, but are not limited to:

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# DIS STUDY ABROAD IN SCANDINAVIA

- Literature Search and Citation Skills
- Research Ethics
- Interpreting and Analyzing Data and the Significance of Results
- Communicating Research Findings

## Research Mentor – Oscar Verho, PhD



Ph.D. in Organic Chemistry (Stockholm University, 2014). Group Leader, Department of Organic Chemistry, Stockholm University.

### Course Schedule

In addition to these dates, **weekly meetings** with your mentor are required. It is up to you to find a time with your mentor for these weekly check-ins. If you need more meetings, it is your responsibility as the student to request such from your mentor.

### Before Arrival to Stockholm

Once accepted you will be connected to your mentor(s) via email. You will then contact your mentor(s) and briefly introduce yourself further. Please note some mentors may give you 10 – 15 hours of research literature to read before your semester start.

### Arrivals Week

Research Assistant Orientation: *Introduction to Research at DIS*

Location: DIS, TBD

Time: TBD

### Arrivals Week

Meet and Greet with your Mentor. Information about your initial meeting time is provided during the orientation.

### February

Workshop 1:

- Research Writing Skills

Readings for Workshop: Check Canvas

Check in Meeting 1

Location: DIS, TBD

Date: TBD

### March

Literature Summary Review Due by 16.00: Date TBD

### March

Check in Meeting 2

Location: DIS, TBD

Date: TBD

### March

Draft Outline of Research Project Due by 16.00: Date TBD

### April

Workshop 2:

- Communicating Research Findings

Readings for Workshop: Check Canvas

Check In Meeting 3

Location & Time: DIS, TBA

Date: TBD

### April

Outline of Research Project Due by 16.00: Date TBD

### April

Abstract Due by 16.00

Submission of Poster by 12.00

More detailed information on poster formatting and submission will be provided in advance.

### May

*Research Symposium*

Present your research through a Poster Session

Location: DIS, TBA

Time: 15.00-17.00

More detailed information provided at a later date.

### May

Research Paper Due by 16.00

## Timeline and Procedures in the Application Process

Summer 2019	Research Opportunities for Spring 2020 are available on the DIS website.
November 5	Deadline to apply to a Research Assistant course
November	You may have a Skype interview with a potential Research Supervisor at this time.
December	You will receive information about your application status no later than early December.
December – arrival in CPH	If accepted, you will be connected to your mentor(s) via email It is highly suggested that you briefly introduce yourself to your mentor. Please note: You may be expected to read up to 10-15 hours' worth of research literature before the semester start.

### Disability and Resource Statement

Any student who has a need for accommodation based on the impact of a disability should contact the Office of Academic Support ([acadsupp@dis.dk](mailto:acadsupp@dis.dk)) to coordinate this. In order to receive accommodations, students should inform the instructor of approved DIS accommodations within the first two weeks of classes.

### Policies

#### Attendance

It is crucial for your learning that you stay on task and hand in assignments on or before the due date. All work— including in-class projects – have to be completed in order to pass the class. Late papers or projects will be marked down with 1/3 of a grade for each day it is late.

#### Academic Honesty

#### Plagiarism and Violating the Rules of an Assignment

DIS expects that students abide by the highest standards of intellectual honesty in all academic work. DIS assumes that all students do their own work and credit all work or thought taken from others. Academic dishonesty will result in a final course grade of "F" and can result in dismissal. The students' home universities will be notified. DIS reserves the right to request that written student assignments be turned in electronic form for submission to plagiarism detection software. See the *Academic Handbook* for more information, or ask your instructor if you have questions.

#### [Academic Regulations](#)

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